1904MNRAS..64..669D

for this plate (2294) in column 5 ; it will, however, be necessary to divide those sums by 2 to reduce them to the same scale as adopted at Greenwich, *i.e.* the sum of D and R diameters.

In the formula given by Dr. Christie

$$\text{Mag.} = C - n\sqrt{d}$$

where C is a constant to be determined, d is the measured diameter, the unit being 0″·15 ; and n a constant which varies slightly with the duration of exposure. The mean value of n is found to be at Greenwich 0·73 for 20 sec., 0·77 for 6 min., and 0·84 for 40-min. exposures. In making the present comparison I have adopted 0·82 as the value of n for plate 2294, and have used B.D. magnitudes for twenty-two stars in the comparison with the Oxford measures, when divided by 2, and obtain 14·78 as the value of C. From this data I have formed Table III.

TABLE III.

Diameter.	0·82$\sqrt{d}$.	C−·82$\sqrt{d}$. mag.
5	1·84	12·94
10	2·59	12·19
15	3·17	11·61
20	3·67	11·11
25	4·10	10·68
30	4·49	10·29
35	4·85	9·93
40	5·18	9·60
50	5·80	8·98
60	6·36	8·42
70	6·86	7·92
80	7·33	7·45
90	7·78	7·00

University Observatory, Oxford :
1904 *May* 12.

The Definitive Places of the Standard Stars for the Northern Zones of the Astronomische Gesellschaft. By A. M. W. Downing, D.Sc., F.R.S.

In *Astron. Nachrichten*, Nos. 3927–9, Professor Auwers has published his definitive corrections to the provisional places of the standard stars for the northern zones of the *Astronomische Gesellschaft*, which have been adopted in the reduction of the German zone observations. The Appendix to the *Berliner Jahrbuch* for 1906 supplies the corresponding corrections, for 1906·0, to the places of these stars as given in the body of that work.

It may be of some interest, therefore, to exhibit the results of a comparison of the places of the *Berliner Jahrbuch* stars, thus corrected, with their places as derived from Newcomb's "Fundamental Catalogue," which are given in the *Nautical*

1904MNRAS..64..669D

Almanac for 1906; thus furnishing the systematic differences between the two Fundamental Catalogues from the North Pole to −25° Decl. for the epoch 1906.

The stars available for the comparison have been arranged in order of declination, and then combined in convenient groups. The further comparison in R.A. of stars within 13° of the pole has not been carried out. In forming the groups the following stars have also been omitted as being unsuitable for the purpose, viz. 61 *Cygni*, *α Canis Minoris*, *γ Virginis*, and *α Canis Majoris*.

The individual comparisons for these omitted stars, taken in the sense *Nautical Almanac*—*Berliner Jahrbuch*, are as follows:

Name of Star.		Approx. Decl.		Δα.	Δδ.
		°	′	s	″
λ Ursæ Minoris...	...	+89	0	−·436	...
α Ursæ Minoris...	...	88	48	−·083	...
51 H. Cephei ...	...	87	12	−·314	...
δ Ursæ Minoris...	...	86	37	−·028	...
ε Ursæ Minoris...	...	82	12	−·025	...
ζ Ursæ Minoris...	...	78	5	+·098	...
γ Cephei... ...	...	77	6	+·062	...
61′ Cygni ...	...	38	17	−·044	+·21
α Canis Minoris...	...	+ 5	28	−·003	−·66
γ′ Virginis ...	...	− 0	56	+·061	+·29
α Canis Majoris...	...	−16	35	−·093	+·11

The following Table exhibits the results for the groups, taken in the sense already mentioned, and the number of stars in each group. The total number of stars used for the comparison is in R.A. 255, and in Decl. 262.

Mean Decl.		Mean Δα.	Mean Δδ.	No. of Stars.	Mean Decl.		Mean Δα.	Mean Δδ.	No. of Stars.
°	′	s	″		°	′	s	″	
+87	54	...	+·04	4	22	34	+·005	−·03	17
79	8	...	−·04	3	17	26	+·006	+·13*	15
70	50	+·052	−·01	5	12	41	+·006	+·10	19
62	40	+·048	+·03	8	7	46	+·004	+·15	24
57	32	+·047	+·15	9	+ 3	8	+·002	+·28	12
52	40	+·019	+·17	5	− 1	58	+·003	+·28	18
47	41	+·011	+·11	6	7	56	+·001	+·17	19
42	45	+·017	+·15	9	12	21	+·002	+·21	10
38	8	+·006	+·04	9	16	50	−·002	+·24	17
32	25	+·001	+·01	12	22	31	−·001	+·10	15
27	41	+·005	+·05	16	−28	35	−·003	−·14	10

* Or +″·08 (adopted for curve) omitting *α Delphini*, for which Δδ = +″·86.

1904MNRAS..64..669D

The above quantities have been graphically represented on cross-ruled paper, and curves drawn in the usual manner, from which the Δα and Δδ, representing Newcomb—Auwers for the epoch 1906 have been read off for each 5° of declination. The results are exhibited in the columns headed I. in the last Table below. The proper quantities, interpolated from those given in these columns, have been then applied, with reversed signs, to the Δα and Δδ for each individual star (omitting the four stars mentioned above) which lies between the limits of Decl. +50° and −28°. These stars have been arranged in order of R.A., and the residual differences combined in groups of 1^h each. The results, which are exhibited in the following Table, are assumed to represent the systematic differences depending on R.A.

By proceeding exactly as before in the case of the differences depending on declination, those depending on R.A. have been read off from the appropriate curves for the beginning of each hour of right ascension. The results are exhibited in the next Table but one.

Mean R.A. h m	Mean Δα. s	Mean Δδ. ″	No. of Stars.	Mean R.A. h m	Mean Δα. s	Mean Δδ. ″	No. of Stars.
0 31	+·013	−·02	10	12 27	+·001	−·06	9
1 37	·000	·00	9	13 32	−·007	+·04	8
2 29	+·003	−·09	8	14 25	+·010	−·05	7
3 31	+·006	+·03	12	15 34	−·004	+·07	10
4 35	+·002	+·07	10	16 29	−·008	+·07	10
5 27	+·003	·00	17	17 24	−·002	−·05	9
6 32	+·001	+·08	10	18 33	−·011	+·01	8
7 28	−·001	·00	6	19 25	−·003	−·05	11
8 30	·000	+·02	9	20 29	+·003	·00*	11
9 33	−·008	+·02	7	21 28	·000	·00	7
10 26	−·003	+·09	6	22 30	+·001	−·01	11
11 20	·000	−·09	9	23 24	−·002	+·01	8

N − A (1906).

R.A. h	$\Delta\alpha_a$. s	$\Delta\delta_a$. ″	R.A. h	$\Delta\alpha_a$. s	$\Delta\delta_a$. ″
0	+·003	·00	7	·000	+·04
1	+·007	−·01	8	−·001	+·01
2	+·005	−·03	9	−·002	+·02
3	+·006	−·03	10	−·005	+·03
4	+·005	+·05	11	−·002	−·01
5	+·004	+·03	12	+·002	−·05
6	+·003	+·04	13	+·002	−·01

* Or −″·07 (adopted for curve) omitting α *Delphini*, for which Δδ = +″·76.

1904MNRAS..64..669D

R.A.	$\Delta\alpha_\alpha$.	$\Delta\delta_\alpha$.	R.A.	$\Delta\alpha_\alpha$.	$\Delta\delta_\alpha$.
h	s	″	h	s	″
14	·000	·00	19	−·009	−·02
15	−·001	+·01	20	+·001	−·06
16	−·007	+·07	21	+·002	−·03
17	−·005	−·01	22	+·002	−·01
18	−·008	−·02	23	·000	−·01

The proper quantities, interpolated from the immediately preceding table, have then been applied, with reversed signs, to the differences for each individual star arranged in order of declination. The residuals give a second approximation to the systematic differences depending on declination, which (proceeding exactly as in the first approximation) are found to be those given in the columns headed II. in the final Table.

N−A (1906).

Dec.	$\Delta\alpha_\delta$.		$\Delta\delta_\delta$.	
	I.	II.	I.	II.
°	s	s	″	″
+85	...	...	+·01	+·01
80	...	...	−·03	−·04
75	...	...	−·03	−·03
70	+·052	+·053	−·01	·00
65	+·049	+·050	+·01	+·02
60	+·047	+·047	+·09	+·10
55	+·033	+·032	+·16	+·17
50	+·013	+·014	+·14	+·14
45	+·012	+·011	+·13	+·13
40	+·010	+·009	+·10	+·10
35	+·001	+·001	+·02	+·02
30	+·002	+·003	+·03	+·03
25	+·005	+·005	·00	−·01
20	+·005	+·004	·00	−·01
15	+·006	+·006	+·10	+·10
10	+·005	+·006	+·11	+·11
+ 5	+·003	+·002	+·22	+·22
0	+·002	+·003	+·28	+·27
− 5	+·002	+·002	+·20	+·21
10	+·001	·000	+·18	+·18
15	·000	−·001	+·23	+·23
20	−·001	−·001	+·18	+·18
−25	−·002	·000	·00	·00

1904MNRAS..64..669D

It is very satisfactory to find a considerably closer agreement between the two systems of fundamental star places, due to the application of the definitive corrections deduced by Professor Auwers, than formerly obtained. The great improvement that has been effected in this respect is made obvious by comparing the reduction tables given above, for 1906, with those in Dr. Cohn's paper published in *Astron. Nachrichten*, No. 3742, which exhibit similar quantities applicable to the provisional fundamental catalogues of the *Astronomische Gesellschaft*, for the epochs 1875 and 1900. In particular it will be noticed that the right ascensions of stars of moderate declination are now in very close accord indeed; due not only to the agreement in the adopted position of the equinox in the respective systems, but also to the agreement (at the epoch considered) in the mean positions of groups of stars extending over a considerable range of declination.

H.M. Nautical Almanac Office:
1904 *May* 9.

Note on a Suggested Method of Determining the Declination of Stars. By A. E. Conrady.

The values of the declination of stars and of the latitude of observatories depend directly on the readings of graduated circles, and are limited to the accuracy with which the errors of graduation and of flexure have been, or can be, determined, besides involving errors of the refraction tables.

The following method of determining the declination of stars not too near the equator requires circle readings of a lower order of accuracy than that of the resulting declinations. I believe it is novel; whether it is of practical value remains an open question.

When the idea first occurred to me (1899 March 21) I began my note of it as follows:

"The clock is without doubt the most accurate and cheapest instrument for measuring angles; and in the case of many observations, made at different periods of the day and of the year, it is entirely free from constant errors.

"The question arises, whether declinations and latitude might not be obtained by transit observations based on observations of time only. This is indeed possible."

The method calls for a transit instrument in the meridian firmly united with a second telescope which has its optical axis parallel to the plane defined by the axis of rotation and the optical axis of the principal telescope, and is capable of being